

Nutritional and storage qualities of catfish (*Clarias gariepinus*) smoked with *Anthonatha macrophylla*

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ABSTRACT

The effect of *Anthonatha macrophylla* (Beauv 1964) on the nutrient composition and keeping qualities of smoked dried fish *Clarias gariepinus* (Burchell) were studied. Twenty (20) samples were harvested, degutted and washed under tap water prior to smoking for a period of 4 hours. Results of the nutrients and sensory evaluation revealed that the smoke from *Anthonatha macrophylla* produced fish with pleasant colour, flavor/aroma, texture and taste. Nevertheless, the chemical compound from the wood yielded product with moderate shelf life up to 5 days. Therefore, it could be recommended for fish smoking without negative effect on nutrients while sensory evaluation showed high score on acceptability.

Key words: Catfish, Nutrient, Storage Qualities

INTRODUCTION

Fish is an important and the cheapest source of animal protein which accounts for about 37% of Nigeria's total protein intake. It provides 22% of the protein intake in Sub-Sahara Africa (FAO, 2003). Fish is a highly perishable commodity that undergoes spoilage as soon as it is harvested. Once spoilage set in, the odour/flavor, texture, colour and sometimes the chemical composition changes (Gupta and Gupta, 2006).

It is estimated that post harvest losses of fish which is often more than 50% in developing countries exceed those of any other food commodity (Olatunde, 1996). Prevention of microbial spoilage of fish may be achieved by different methods such as smoking, drying, freezing, salting and use of modified atmospheric storage, (Awan and Okaka, 1985; Gupta and Gupta, 2006).

Fish smoking is a traditional method of processing globally, it accounts for about 3% of the world's catch and also increases the shelf-life (Olowoniyi *et al.*, 1998; Gupta and Gupta, 2006). The flesh of smoked fish is delicate, succulent, delicious and can be readily consumed without further processing (Olowoniyi *et al.*, 1998; Eyo, 2001). This study is designed to determine the effect of smoking catfish with *Anthonatha macrophylla* wood on the nutrients and keeping qualities (sensory evaluations).

MATERIALS AND METHODS

Experimental station

This study was carried out at the processing laboratory of Food Technology Department, Federal Polytechnic Nekede, Owerri, Nigeria.

Experimental design

A total of twenty *Clarias gariepinus* with mean weight 475 ± 25 g were caught from the fish farm of Federal Polytechnic Nekede, Owerri, Nigeria. The live weights were taken using digital weighing balance. The fish were gutted, washed thoroughly with water to remove slime and blood; thereafter, the dressed weights were taken. However the fish were transferred into a basket for proper draining of water prior to smoking. They were also covered with a muslin cloth to prevent dust and flies.

Smoking Process

Smoking was conducted using *Anthonatha macrophylla* wood in a traditional smoking kiln for a period of 4 hours, during which turning over of the fish was done at intervals to achieve a uniform smoking. The fish was covered with carton to retain heat from the smoke and prevent contamination by dust and flies. After the hot smoking, the smoked products were removed from the kiln and allowed to cool at room temperature before they were weighed to determine the moisture loss.

Thereafter, smoked fish were taken to the quality control room and stored at room temperature for a period of 7 days where organoleptic assessment was carried out and data collected on 9-point hedonic scale.

Organoleptic Assessment

Smoked fish were submitted to ten trained test panel from Food Technology Department of the College to evaluate the sensory qualities such as texture, taste, aroma and colour. These parameters were assessed on a nine (9) points hedonic scale (9 = excellent; 8 = very good; 6 = good; 4 = fair; 2 = poor and 0 = bad) according to Afolabi *et al.*, (1984). Panelists filed in a single line to assess the smoked products were requested to mask their mouth with water after tasting each sample to avoid bias in judgment/evaluation. The storage qualities (sensory evaluation) of the smoked fish were examined daily between 9.00-10.00am for a period of 7 days.

Proximate Analysis

Proximate analysis was conducted on the nutrient composition of flesh of smoked fish such as crude protein, crude fiber, Fat, Ash and Moisture were determined using standard procedure of A.O.A.C. (2000).

Statistical Analysis

Data were subjected to one-way analysis of variance (ANOVA) at 5% level of significance. Where significant differences occurred, means were separated with Duncan multiple range test (Steel and Torie, 1980).

RESULTS AND DISCUSSION

The result of the weight characteristics of *Clarias gariepinus* smoked with *Anthonata macrophylla*

wood is presented in Tables 1. The average moisture loss (63.34%) from the smoked catfish is similar to the value of less than 65.00% recommended by Cardinal *et al.*(2001). The crude protein content of the smoked catfish was found to be 68.17%, this value is higher than the value of 53.10% recorded by Ogbonna and Ibrahim (2009) but in agreement with 68.40% reported by Olayemi *et al.*, (2011). The values of 20.19 and 5.40% were obtained for crude fat and Ash respectively; these values are similar to earlier reports (Ogbonna and Ibrahim, 2009; Olayemi *et al.*, 2011) indicating that the wood had no inhibition towards the nutrients.

Reports of the sensory panelists revealed that the smoked catfish retained very good scores for texture, flavor, colour and taste (≥ 7.0) within the first 48hours of smoking exercise (Table 2) but the flavor and taste showed a decline ($p < 0.05$) from the fifth day probably due to microbial effect and degradation of protein in the muscle coupled with onset of oxidative rancidity that might have produced hypoxanthine and trimethylamine (Johnson *et al.*,1994). The general acceptability in all the sensory parameters indicated that the wood might have inherent chemical compounds such as carbonyl, phenols and syringol typical of hard woods. These compounds are responsible for the pleasant colour, taste and flavor/aroma in smoked products (Eyo, 2001). The improved shelf live up to 5th day may be due to action of smoke and heat that reduced water activity and impaired the action of spoilage microbes (Abolagba and Osifo, 2004).

CONCLUSION

The results obtained from this study showed that *Anthonata macrophylla* possessed good potential as fuel for smoking African catfish without inhibiting the nutrients and consumer acceptability, hence, recommended for fish smoking.

Table 1: Weight characteristics of catfish smoked with *Anthonata macrophylla* wood.

Live weight Of fish (g)	Dressed weight (g)	Weight after smoking (g)	Total weight loss	Percentage weight loss
500	400	200	300	60.00
450	400	150	300	66.7

Average weight loss (%) = 63.34

Table 2: Effect of *Anthonata macrophylla* on the storage quality of smoked catfish (*Clarias gariepinus*) using Organoleptic assessment.

Parameters	Duration of Storage (Days)						
	1	2	3	4	5	6	7
Texture	7.4 ^a	6.8 ^a	7.0 ^a	7.4 ^a	6.4 ^a	6.5 ^a	6.6 ^a
Flavor	7.8 ^a	7.4 ^a	6.8 ^a	6.7 ^a	6.5 ^a	5.3 ^a	3.3 ^c
Appearance	7.9 ^a	7.1 ^a	7.5 ^a	7.0 ^a	6.3 ^a	6.2 ^a	6.4 ^a
Taste	8.1 ^a	7.1 ^a	6.5 ^a	6.4 ^a	5.8 ^b	3.8 ^c	2.1 ^c

^{ab} means not followed by the same superscript letter are significantly different (P< 0.05) within row

Table 3: Proximate composition of Catfish smoked with *Anthonata macrophylla* wood.

PARAMETERS	CONCENTRATION (% DM)
Crude Protein	68.17 ± 0.03
Crude fat	20.19 ± 0.12
Ash	5.40 ± 0.02
Moisture	4.98 ± 0.03
Nitrogen Free Extract	1.27 ± 0.10

LITERATURE CITED

- Abolagba OJ and Osifo SJ, 2004.** The effect of smoking on the chemical composition and keeping qualities of catfish (*Heterobranchius bidorsalis*) using two energy sources. *Journal of Agric. Forestry and Fisheries (JAFF)*. 5(1): 27-30.
- Afolabi OA, Arawomo OA and Oke OL, 1984.** Quality changes of Nigeria Traditional processed freshwater species. In: Nutritive and Organoleptic changes. *J. food Tech*, 19:333 – 340.
- AOAC. 2000.** Association Official Analytical Chemist. *Official Methods of Analysis 17th edition* Washington D.C.
- Awani .A and IC Okaka, 1985.** *Element of food spoilage and preservation*. Snaap Press Enugu, Nigeria Pp 60-70
- Cardinal MC, Knockaert O, Torrissen S, Sigurgisladottir T, Morkore and JL Vallet, 2001.** Relation of smoking parameters to the yield colour and sensory quality of smoked Atlantic salmon (*Salmosalar*). *Food Res. Int.*, 34: 537-550.
- Eyo AA, 2001.** *Fish processing Technology in the Tropics*. University of Ilorin press. Pp. 112-129.
- FAO 2003.** Food and Agriculture Organization. In: The state of food insecurity in the world (Sofi 2003) Rome, Italy.
- Johnson WA, FJ Nicholson and A Roger, 1994.** Freezing and refrigerated storage in fisheries. Stroud. Series. *FAO Fisheries Technical Paper* 340: 143.
- Gupta SK and PC Gupta, 2006.** *General and Applied Ichthyology (Fish and Fisheries)*. S. Chand and Co. Ltd, Ram Nagar, New Dehli. 1045-1068.
- Ogbonna C. and MB Ibrahim. 2009.** Effect of Drying methods on proximate compositions of catfish (*Clarias gariepinus*). *World Journal of Agric. Sciences* 5(1): 114-116.

Olayemi FF, MR Adedayo, El Bamishaiye and EF Awagu, 2011. Proximate composition of catfish (*Clarias gariepinus*) smoked in Nigerian stored products research institute (NSPRI): Developed Kiln. *Int. J. fisheries and Aquaculture* **3**(5): 96 – 98.

Olatunde AA, 1989. Approaches to the study of Fisheries Biology in Nigeria inland waters in Kanji. Proc. National Conf. of two decades of research on Lake Kanji. 538-541.

Olowoniyan FO, PI Bolorunduro, H. Dikko and H.Chindo, 1998. Preparation, Processing and Utilization of Fish products.

Steel RGD and JH Torie (1980). *Principles and Procedures of Statistics*; McGraw Hill Book, New York.